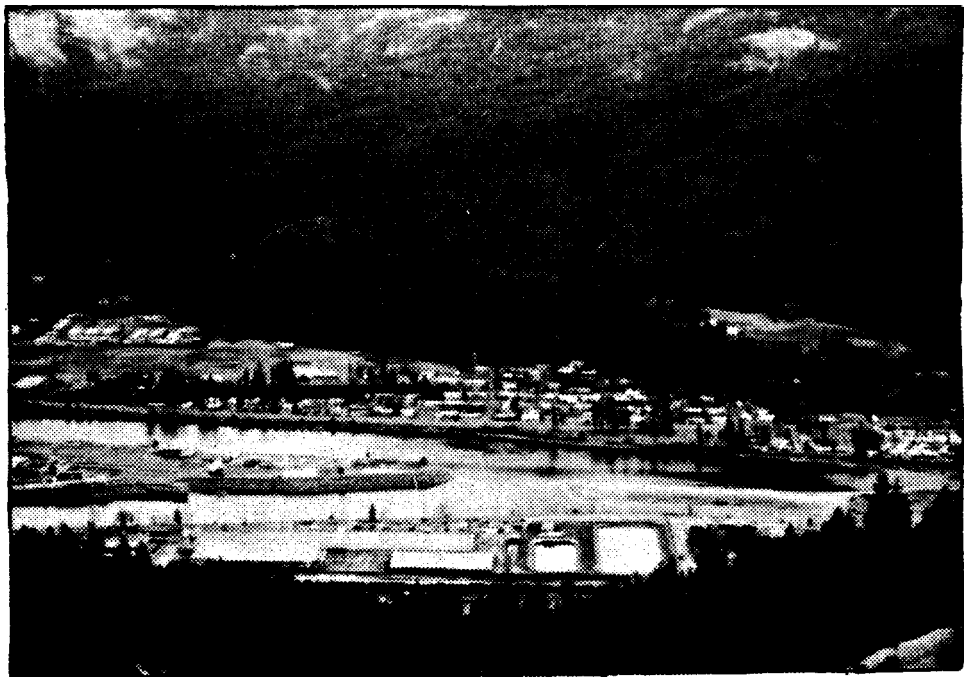
CLEARWATER FISH HATCHERY

1990 Chinook Brood Year Report



by

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June 1993

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Cont.)

Page

LIST OF APPENDICES

LIST OF APPENDICES (Cont.)

ABSTRACT

Clearwater Hatchery

As of October 1991 when our pre-smolts were released, Clearwater Fish Hatchery was under the final stages of construction. Three hatchery residences were completed, and personnel began to move into the houses.

Red River

Red River weir was installed on June 11, 1990 and taken out of operation on September 12, 1990. The run total was 53 fish; 35 adult males, 16 females, and 2 jacks. Three females, 11 adult males, and 1 jack were released during the trapping season to spawn naturally. Nine females, 20 adult males, and 1 jack were released on August 31, 1990 from the pond into Red River to spawn naturally.

Age class breakdown of this run was 2 jacks, 26 four-year old males, 9 five-year old males, and 4 five-year old females. Pre-spawning mortality was 8 fish (15.1%).

Crooked River

Weir installation and operation began on June 11, 1990. Due to construction delays, the trap was not operated until June 29, 1990. The first fish was trapped on June 29. After four hours of operation, we had trapped 1 chinook and about 20 bull trout ranging from 2 to 5 pounds. The last fish entered the trap on September 23. Trapping was shut down on September 29, with a total of 27 adults and 2 jacks. We released ten males, two females, and one jack directly from the trap above the weir to spawn naturally. Ponded fish were seven males, eight females, and one jack.

There is no adult holding at this site. Ponded fish must be transported 28 miles to the Red River facility. These adults were held separate from the Red River stock. When the decision was made to release all ponded fish seven adult males and seven females were transported back to Crooked River. They were planted approximately two miles above the trap site. Mortality prior to releasing all of the fish was one jack and one female for a mortality rate of 6.9%.

Age class breakdown of this run was 2 jacks, 15 four-year old males, 2 five-year old males, 8 four-year old females, and 2 five-year old females. Pre-spawning mortality was two fish (6.9%).

Powell

Powell weir was installed on March 28, 1990 and taken out of operation on September 24, 1990. The run total was 179 fish; 107 adult males, 70 females, and 2 jacks. Fifty-five females and 107 males were released to spawn naturally. Five females and five males were spawned, and green eggs were transported to Kooskia for incubation. Males used for spawning were not killed and are also included in the release numbers. Egg survival was not available to us; these were processed by Dworshak Hatchery.

Age classes of this run was 2 jacks, 91 four-year old males, 16 five-year old males, 66 four-year old females, and 4 five-year old females. Pre-spawning mortality was 12 fish (6.7%).

Our age class breakdown for all three trap sites was as follows: less than 25 inches (64 cm) were jacks, over 25 inches (64 cm) to 32 inches (82 cm) were four-year olds, and 32 inches (82 cm) and over were five-year olds. Our break down is from limited historic Coded-wire tag (CWT) data from Ron Lindlund and Rodney Duke (Appendices A.1 and E.1).

INTRODUCTION

Funding Source

Construction responsibility for the Lower Snake River Compensation Plan (LSRCP) was assigned to the Walla Walla District Army Corps of Engineers, while responsibility for fish hatchery operation and maintenance funding was to be accomplished by "one of the Federal fisheries agencies." The question of operation and maintenance funding was settled in 1977 with the signing of an interagency agreement by the Corps, National Marine Fisheries Service (NMFS), and the Fish and Wildlife Service (FWS). It stated that the FWS would budget for and administer operation and maintenance funding for LSRCP fish hatchery programs (responsibility for administration and operation and maintenance for fish passage and wildlife programs remains with the Corps).

Public Law 99-662, approved November 17, 1986, modified the Water Resources Development Act of 1976 in accordance with recommendations contained in a report from the Chief of Engineers, dated March 6, 1985. The Chief's report confirmed the 1977 NMFS/FWS agreement on Page 2, Section 4.d; "The U.S. Fish and Wildlife Service should be designated to fund the operation and maintenance of all fish rearing facilities." Regarding ownership of property, the report noted in Section 5.3, "Transfer of jurisdiction over all Compensation Plan fish hatcheries, appurtenant facilities and lands to the U.S. Fish and Wildlife Service for operation, maintenance, and replacement shall occur upon completion of construction by the Corps of Engineers." Consistent with the titles of LSRCP fish hatcheries and satellite facilities to the FWS as they are completed and become fully operational.

The Corps estimated cost for construction of Clearwater Hatchery and the three satellite facilities was to be $43,153,000 (Joe McMichael's report December 1991).

Location

Clearwater Hatchery

Clearwater Fish Hatchery is located on the north bank of the North Fork of the Clearwater River, downstream from Dworshak Dam, 72.5 miles from Lower Granite Dam, and 504 miles from the mouth of the Columbia River.

Red River

Red River satellite facility is located approximately 15 miles east of Elk City, Idaho. Approximately 186 miles upstream from Lower Granite Dam and 618 miles from the mouth of the Columbia River.

Crooked River

Crooked River satellite facility is located 20 miles downstream of Red River. The trap is located one-half mile upstream of the mouth of Crooked River, a tributary of the South Fork of the Clearwater River. The rearing ponds are ten miles upstream from the Crooked River adult trap. Crooked River is 172.5 miles from Lower Granite Dam and 604 miles from the mouth of the Columbia River.

Powell

Powell satellite facility is located 122 miles east of the Clearwater Hatchery at the head waters of the Lochsa River. Missoula, Montana is the closest town, which is 45 miles east. Powell is 192.5 miles from Lower Granite Dam and 624 miles from the mouth of the Columbia River.

Species Reared

Clearwater Hatchery had no production this year. Red River, Crooked River, and Powell satellite facilities all rear spring chinook salmon.

Synoptic History

Clearwater Hatchery

The future steelhead egg source will be Dworshak National Fish Hatchery. The spring chinook salmon will also come from Dworshak Hatchery, as well as the Red River, Crooked River, and Powell satellite facilities.

Red River

There have been historic plants from Rapid River and Dworshak National Fish Hatchery. These plants were fry and smolts raised or acclimated in the rearing ponds, and eyed eggs that were buried in the spawning channel 200 yards upstream of the facility in the South Fork of Red River.

Crooked River

There have been historic plants from Dworshak Hatchery, including smolts and adult outplants.

Powell

There were historic plants from Rapid River and Dworshak Hatchery of both fry and smolts. The first fish truck ever loaded was in 1980. This was a load of chinook smolts from the cement pond at Rapid River Hatchery that were planted from White Sands Bridge at the present Powell facility.

OBJECTIVES

Mitigation Goals

The goal of Clearwater Fish Hatchery and satellite facilities is to return 12,000 adult salmon and 14,000 adult steelhead over Lower Granite Dam.

Idaho Department of Fish and Game Objectives

The objectives of IDFG for the Clearwater Hatchery are to rear and release chinook salmon and steelhead into the upper Clearwater River drainage. The objectives for Red River, Crooked River, and Powell facilities are to rear and release chinook salmon into the Red River drainage, the Crooked River drainage, and the Lochsa River. Overall objectives are to re-establish historic fish runs into the tributaries, to enhance the wild spawning population, and increase sport and tribal fishing opportunities.

FACILITY DESCRIPTION

General Description

Clearwater Hatchery

The Clearwater Fish Hatchery is the final facility to be built by the U.S. Army Corps of Engineers under the LSRCP. This facility is also the largest of the hatcheries to be built under the LSRCP.

The administration/dormitory building has 4,536 square feet. The dormitory section includes four bunk rooms with maximum capacity of 16 people, a living room, dining room, kitchen, mens and womens shower rooms, and a laundry room. The administration portion consists of a 25 ft x 36 ft office space with four office dividers, file cabinets, and three additional work stations. A 13 ft x 18 ft visitors reception area is the entryway to the office.

The shop area covers 1,783 square feet. There is a vehicle maintenance shop and a smaller mechanical repair shop. A screen storage room has been altered for a carpentry shop.

The hatchery room covers 24,840 square feet. This building also has an incubation room with 1,109 square feet and a walk-in freezer with 656 square feet.

A screen and equipment storage building is located on the west end of the property, which has 1,280 square feet.

There are seven residences located on the hatchery grounds, with 1,285 square feet of living space and 507 square feet of storage/garage space. Each residence also has a 14 ft x 12 ft storage building.

A 1.8-mile long pipeline runs upstream to the Dworshak Dam. The pipeline goes up the face of the dam to an elevation of 1,357 feet, then through the dam into the reservoir. The 18-inch pipe is stationary at the 1,357-foot level, with a screened inlet to keep out debris. This pipe supplies cool water to the hatchery. The 48-inch flexible plastic pipe goes to the surface of the reservoir and is suspended from a floating platform. A winch allows us to raise and lower this pipe to locate the thermocline of the desired water temperature. This pipe supplies the warm water to the hatchery. The distribution structure reduces the 286 psi of the high pressure supply lines to a flow of 7 psi to the hatchery. The structure consists of a primary chamber and a secondary chamber. Each chamber has two ported sleeve valves that are used to reduce the pressure. One is in operation, while the other is on standby for emergencies.

A 73,600 cubic foot cleaning sedimentation pond is used during cleaning to settle out the settleable solids produced by the hatchery. A 414,00 cubic foot final sedimentation pond settles waste from the total flow of hatchery operation and the outflow of the cleaning sediment pond.

Red River

The Red River site is located on 6.29 acres. There are three structures on this facility. A 16 ft x 25 ft freezer storage building, which houses a walk-in freezer, some dry storage shelves, and an area to weigh out daily feed; a 12 ft x 16 ft work shop and Formalin storage building; and a 25 ft x 25 ft support cabin with a kitchen, a living room, a 10 ft x 12 ft shop area, and a bunk room with four beds.

Crooked River

There are two separate sites to this facility. The first is the trap and support cabin located one-half mile upstream of the mouth of Crooked River. The support cabin is 25 ft x 25 ft with a small shop, a kitchen/dining room, a bathroom, and a bedroom with two bunk beds.

The weir consists of removable posts and panels that are supported by an iron bridge across Crooked River. The trap is a 9 ft x 13 ft x 4 ft deep holding container. There are no holding ponds here; all fish are either released directly from the trap or transported to Red River holding ponds.

Ten miles upstream from the cabin are two raceways. The actual rearing space measures 145 ft x 20 ft x 4 ft deep, which gives us 11,600 cubic feet. There is a cleaning waste pond and final settling pond to meet EPA water quality standards. One mile further upstream is the freezer building. This building is 25 ft x 25 ft and has an indoor area for dry storage.

Powell

The Powell facility is located at the confluence of Crooked Fork and White Sands Creek, which form the Lochsa River. There is one rearing pond that measures 165 ft x 65 ft x 5 ft deep. A diversion and intake screen structure are located on Walton Creek, and a pump house is located on White Sands Creek. There are two adult ponds that measure 100 ft x 12 ft x 4 ft deep. A floating weir in the Lochsa diverts fish into Walton Creek, where they encounter another weir, which then diverts them into the fish ladder and fish trap. An open-bay spawning

shelter is at the head end of the adult ponds and provides 806 square feet of work space. Also on-site is a support cabin with a kitchen/dining/living room, a bathroom, and a bedroom with two sets of bunk beds. There is also a garage/shop and walk-in freezer to store fish feed.

Production Capacities by Unit

Clearwater Hatchery

The steelhead rearing facilities consist of 300 ft x 10 ft x 6 ft raceways that are supplied by a center-head raceway with an east and west bank of 12 raceways. Total rearing space of these 24 raceways is 216,000 cubic feet, and this area will rear a maximum capacity of 2.4 million steelhead smolts with a .3 density index (Piper). A flow of approximately 1.67 cfs is available for each raceway; but it is suspected that this flow will only allow 1.7 million steelhead to be reared in these raceways without exceeding the flow index of 1.2 (Piper). All water for these raceways flows through degassing towers, then into the head raceway. These raceways are supplied with water from the surface intake only.

Chinook raceways are each 200 ft x 10 ft x 3 ft. These 11 raceways have a total rearing space of 77,000 cubic feet. They are supplied with water from both intakes, and a mixing chamber allows for the control of water temperature to rear the chinook. The maximum rearing capacity of these raceways is 1.5 million smolts at a .3 density index (Piper).

The adult holding facility consists of two ponds, with a combined capacity of 8,000 cubic feet and a maximum holding capacity of 800 adult salmon. There is also a covered spawning area with two live wells for on-site egg taking. This facility is supplied with water from the tailrace of the juvenile chinook raceways.

The incubation room contains 40 double-stack Heath incubators with a total of 640 trays available for egg incubation. The upper and lower half of each stack (8 trays each) has a different water supply and drain. This design will aid in segregation of diseased eggs. The maximum capacity of this facility is 5 million green eggs. The incubation room is supplied with both water sources to provide the desired temperature for incubation.

Sixty concrete vats measuring 45 ft x 4 ft x 4 ft are inside the hatchery building for early rearing. Each vat contains 506 cubic feet of rearing space. This part of the facility can rear 5.9 million fish to 287/lb at .3 density index. The vats are supplied with water from each intake. Every vat also has an incubation jar plumbed directly into it, and each jar has a total capacity of 2.6 million eggs.

Red River

The adult holding facility consists of two ponds with a total of 3,440 cubic feet and a trap area 12 ft x 20 ft x 5 ft deep. These ponds have a holding capacity of 350 fish. A removable tripod and panel weir blocks fish passage and diverts them into the fish ladder.

A 160 ft x 65 ft x 5 ft deep rearing pond will rear a maximum of 320,000 chinook smolts. This pond has a hypalon plastic liner with 8- to 10-inch diameter cobble stones on the inclined banks. The bottom of the pond is a bare liner which has aided in pond vacuuming. A catwalk runs the entire length of the rearing pond and holds eight Nielson feeders.

Crooked River

The two raceways together have a capacity of 700,000 juvenile chinook.

Powell

The rearing pond has 52,000 cubic feet of rearing space. Our normal loading is 320,000 fish which will produce the best looking smolts and stay significantly under a .3 density index. The maximum design capacity is 500,000 fish.

The adult ponds have a volume of 9,600 cubic feet and a holding capacity of 960 adult chinook.

WATER SUPPLY

Source

Clearwater Hatchery

Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warm water intake is attached to a floating platform and can be adjusted from 5 feet below the surface to 40 feet below the surface. The cold water intake is stationary at about 245 feet below the top of the dam. An estimated 10 cfs will be provided by the cool water supply and 70 cfs from the warm water supply. Our cool water supply has remained constant at 40°F. The warm water can reach 80°F, but is adjusted regularly to maintain 56°F for as long as possible throughout the year. When water temperatures drop in the fall, the intake will be moved to the 40°F level until water temperatures rise in the spring (Appendix I). All water is gravity flow to the hatchery.

Red River

Red River is supplied by gravity flow from an intake located at the bottom of the South Fork of Red River, 225 yards upstream from the facility. Our water rights permit is for 10 cfs. During low flow in the summer, about 5 cfs is available to the hatchery. Temperatures range from 40°F in the spring to 71°F in early August (Appendix I.1). All water is gravity flow.

Crooked River

Crooked River rearing raceways are supplied by an intake 200 yards upstream of the raceways at Crooked River. Our water rights permit is for 12 cfs at the rearing facility and 10 cfs at the trapping facility. In late summer, only 6 cfs is available. Temperatures range form 42°F to 70°F (Appendix I.2). All water supplied to both facilities is gravity flow.

Powell

The Powell facility receives gravity flow water from Walton Creek. The intake is located 100 yards upstream from the facility. Powell also has a pumped supply from White Sands Creek. Two 7.5-horsepower pumps supply 3 cfs of water. Our water rights permit is for 7 cfs from the gravity flow system on Walton Creek and 3 cfs from the pumped supply out of White Sands Creek. Water temperatures ranged from 45.8°F to 50.2°F from the Walton creek intake and 41°F to 65°F from the White Sands pump station.

Water Quality Analysis

Clearwater Hatchery

Water quality analysis for Clearwater Hatchery is not available at this time.

Red River

The following is water quality analysis is from one-quarter mile above the mouth.

ANALYSIS	RESULTS	DATE ANALYZED
Alkalinity	25.0	10/02/92
Arsenic	<0.005	10/06/92
Cadmium Graphite	<0.001	10/28/92
Copper	<0.01	10/05/92
Hardness	22.0	10/02/92
Lead Graphite	<0.002	10/14/92
Mercury	<0.0005	10/16/92

Crooked River

Water quality analysis for Crooked River is not available at this time.

Powell

The following is water quality analysis from two miles upstream of Powell.

ANALYSIS	RESULTS	DATE ANALYZED
Alkalinity	23.0	10/20/92
Arsenic	<0.005	10/23/92
Cadmium Graphite	<0.001	10/28/92
Copper	<0.01	10/16/92
Hardness	31.0	10/20/92
Lead Graphite	<0.002	10/15/92
Mercury	<0.0005	10/16/92

STAFFING

This year, Clearwater Fish Hatchery had two permanent staff members; Jerry McGehee (Fish Hatchery Superintendent III) and Roger Lanier (Fish Hatchery Superintendei1it I). Doug Burton replaced roger Lanier as Fish Hatchery Superintendent I in November. Our crew also consisted of eight Bio-aides and laborers and one YCC enrollee.

The Red River, Crooked River, and Powell facilities were manned by one temporary person each, which were supervised from the temporary Clearwater Hatchery office in the residence of the Superintendent III at Kamiah, Idaho.

FISH PRODUCTION

Clearwater Hatchery

Clearwater Fish Hatchery had no production this year.

Red River

Adult Collection

The weir and trap were put into operation on June 11, 1990 and was taken out of operation on September 12, 1990. The run peaked on June 26 with 12 fish trapped that day. A total of 35 adult males, 16 females, and 2 jacks were trapped (Appendices C.1 and D.1).

Eleven adult males, three females, and one jack were released directly from the trap above the weir to spawn naturally. Nine females, 20 adult males, and 1 jack were ponded and then later released to spawn naturally. A decision had been made by the Fisheries Bureau at Headquarters to release all fish that were being held for spawning because we had released a very low number of females to spawn naturally, and Dworshak National Hatchery had trapped more chinook than necessary to fulfill their egg needs. They could supply our egg needs with their excess eggs. On August 31, all ponded fish trapped at Red River were released above the weir to spawn naturally, except for CWT fish. The number of fish held and then released were 20 males, 9 females, and 1 jack. Four females, four adult males, and zero jacks died, with a prespawning mortality of 15.1% (Appendix B.1).

Age class breakdown of this run was 2 jacks, 26 four-year old males, 9 five-year old males, 12 four-year old females, and 4 five-year old females. Our age class breakdown was as follows: less than 25 inches (64 cm) were jacks, over 25 inches (64 cm) to 32 inches (82 cm) were four-year olds, and 32 inches (82 cm) and over were five-year olds. Our breakdown is from limited historic CWT data from Ron Lindlund and Rodney Duke (Appendices A.1 and E.1).

Holding and Spawning

Ponded fish were injected with Erythromycin to prevent Bacterial Kidney Disease (BKD). Fish being held for spawning were also treated three times per week with 100 ppm Formalin drip for one hour.

After the sorting operation started, the fish were treated with Formalin four times per week. The females were checked for ripeness two days per week. our first female became ripe on August 31. No mortalities were seen due to fungus. Some small spots of fungus did show up on some fish, and future treatments should be every day after first sort. All morts were hauled to Elk City and disposed of by Walco Sanitation.

Erythromycin injections were administered at a rate of 1 cc/10 lbs of body weight. The injection mixture was 14 grams of Erythromycin Phosphate, 84% active, and 250 milliliters of distilled water. -

Early Rearing Procedures

Brood year 1990 adults were all released and Dworshak stock was introduced into our program at this time. All early rearing took place at Dworshak Hatchery. When the fish were transferred to our project, they were 120 fish/lb. These fish were transferred to us on June 19, 1991.

Final Rearing

Maximum density during final rearing was 0.05 density index. The rearing pond at Red River is 160 ft x 65 ft x 5 ft deep. The rearing space is 52,000 cubic feet. This was the first rearing season for the newly-constructed rearing pond. The pond was completed in the fall of 1990 and used only for a brief acclimation period. The average flow through the pond is three cfs. An Ichthyophtherius outbreak on August 15, 1991 was the only major mortality during this rearing period.

Total mortality due to Ichthyophtherius was 50 fish. Total mortality for the season was 452. The temperatures ranged from 40°F to 71°F during the rearing season (June 19, 1991 to October 15, 1991).

These fish were fed Erythromycin-medicated feed twice. The first feeding immediately after ponding on June 19, 1991. The second feeding was done 21 days before being released on October 23, 1991. These fish were fed at a rate of 1.85% body weight. The growth rate ranged from .14 inches/month in October to .62 inches per month in July.

These fish were 120 fish/lb at ponding. They were fed OMP 4 manufactured by Moore-Clark of LaConner, Washington. They were fed a 50/50 mix of 1/16 and 3/32 pellet until they were 75 fish/lb. Then they were fed 3/32 pellets until 50 fish/lb, then 50/50 mix 3/32 pellet and 1/8 pellet until 40 fish/lb, then 100% 1/8 pellet until fish were planted (Appendix H).

Fish Health

The only disease encountered this season was Ichthyophtherius. It was detected on August 15, 1991 by Doug Munson, Fisheries Pathologist. Doug was responding to our request for an inspection from our observation of an unusual amount of fish flashing in the pond. We first performed a Bioassay test on 30 fish exposed to 90 ppm formalin drip for one hour. The next day we performed a Bioassay at 125 ppm formalin for one hour. These fish were observed for three days and experienced no mortality. On August 20, we treated the fish in the rearing pond at 125 ppm. There was no mortality from this treatment or the following two treatments. Each treatment was separated by one day of no

treatment. Fish were taken off feed for the entire time (Appendix J). No acute mortality occurred this season. The final condition factor of these fish was 3.91. These fish appeared to be the best fish released in three years from the Red River pond.

Fish Marking

All of these fish were marked as hatchery fish with a left pelvic fin clip. This was done at Dworshak Hatchery prior to transferring to Red River. There were no CWT fish at Red River this brood year, but 526 fish were PIT-tagged (Appendix G).

Fish Distribution

All 354,700 spring chinook reared at Red River this year were directly released from the pond into Red River on October 23, 1991. These fish were 31.25/lb (Appendix F).

Crooked River

Adult Collection

Weir installation and operation began on June 11, 1990. Due to construction delays, the trap was not operated until June 29, 1990. The first fish was trapped on June 29. After four hours of operation, we trapped 1 chinook and about 20 bull trout ranging from 2 to 5 pounds. The last fish entered the trap on September 23, and trapping was shut down on September 29. The Crooked River run peaked on July 1, 1990 with five fish being trapped. We trapped a total of 27 adults and 2 jacks (Appendices C.2 and D.2). We released ten males, two females, and one jack directly from the trap above the weir to spawn naturally. Ponded fish were seven males, eight females, and one jack (Appendix B.2).

Age class breakdown of this run was 2 jacks, 15 four-year old males, 2 five-year old males, 8 four-year old females, and 2 five-year old females. Our age class breakdown was as follows: less than 25 inches (64 cm) were jacks, over 25 inches (66 cm) to 32 inches (82 cm) were four-year olds, and 32 inches (82 cm) and over were five-year olds (Appendices A.2 and E.2).

Holding and Spawning

There is no adult holding at this site. Ponded fish from this facility must be transported 28 miles to the Red River facility. These adults were held separate from the Red River stock. When the decision was made to release all ponded fish, seven adult males and seven females were transported back to Crooked River. They were planted approximately two miles above the trap site. Mortality prior to releasing all of the fish was one jack and one female for a mortality rate of 6.9%.

Ponded fish were injected with Erythromycin to prevent BKD. Fish being held for spawning were also treated three times per week with a 100 ppm Formalin drip for one hour to prevent growth of fungus. After the sorting operation

started, they were treated four times per week. No mortalities were seen due to fungus. All mortality carcasses were hauled to Elk City, put into dumpsters, and hauled to a landfill by Walco Sanitation of Grangeville.

Erythromycin injections were administered at a rate of 1 cc/10 lb of body weight. The injection mixture was 14 grams of Erythromycin Phosphate, 84% active, and 250 milliliters of distilled water.

Early Rearing Procedures

Brood year 1990 adults were all released, and Dworshak stock was introduced into our program at this time. All early rearing took place at Dworshak Hatchery. When the fish were transferred to our project, they were 72 fish/lb.

Final Rearing

Maximum density during final rearing was .20 density index. The raceways are 145 ft x 20 ft x 4 ft deep with a rearing space of 11,600 cubic feet. The average flow through the raceways is three cfs. The only major mortality was caused by the intake being plugged due to a severe thunder storm. This happened two consecutive nights, and the total loss was 376,550 fish. Water temperatures ranged from 42°F to 70°F.

These fish were fed OMP-4 manufactured by Moore-Clark of LaConner, Washington. They were fed at a rate of 1.85% body weight throughout the rearing period until water temperatures dropped into the lower 40s. Growth rate ranged from a 0.66-inch increase per month in August to a 0.14-inch increase per month in June. They were fed Erythromycin medicated feed twice; once at initial ponding on June 11, and 21 days before release on October 16, 1991. Each treatment was for 21 days at a rate of 41 grams Erythromycin/100 lbs of fish (Appendix H).

The north raceway was set up as a normal raceway. The south raceway was fitted with baffles spaced 19 feet apart throughout the raceway. Three electric bug zappers were suspended about four feet above the water. This was done to attract additional natural feed. All but 2,000 to 3,000 fish died in the baffled raceway when the intake was blocked. Additional fish were transferred from Dworshak in September and held in the baffled raceway until the October 16, 1991. Although these fish were in the baffled raceway for only a short time, they exhibited quite a difference in behavior from the non-baffled raceway when released. These raceways are flushed directly into Crooked River in identical ways. The fish from the baffled raceways reacted very calmly when they entered the current of Crooked River. Fish from the non-baffled raceways reacted much differently. They raced about in a frenzy, even jumping out onto the bank. Results from this is not conclusive, but definitely different.

Fish Health

There were no fish health problems other than anoxia when the intake plugged (Appendix J).

The organosomatic index was not a requirement of our pathology personnel this year and was not performed. Final condition factor of the fish in the baffled raceway was 3.72 and 4.85 in the unbaffled raceway.

Fish Marking

All fish reared at Crooked River this year were marked with a hatchery clip. Fish in the north (non-baffled) raceway were marked with a left pelvic fin clip on 200,173 fish and fish in the south (baffled) raceway were marked with a right pelvic fin clip 119,235 fish. None of these fish were CWT, and 992 fish were PIT-tagged. Some of these fish may have also received PIT tags when they passed through Russ Kiefer's smolt *monitoring* operations (Appendix G).

Fish Distribution

All 320,400 spring chinook reared at Crooked River this season were released directly from the raceway to Crooked River on October 16, 1991. Fish from the north raceway averaged 21.4 fish/lb and the south averaged 38.5 fish/lb (Appendix F).

Powell

Adult Collection

By the time steelhead trapping was over, the spring high water runoff was at its peak. We were unable to safely remove the weir at this time. With the weir in place this early, we were able to monitor the complete migration of chinook this season. Normal operation would not install the weir until approximately July 4.

The first chinook to enter the trap was on June 12, and the last fish entered the trap on September 17. Powell trap was taken out of operation on September 24. We trapped a total of 177 adults and 2 jacks. The Powell run peaked on September 1, 1990 with ten fish trapped (Appendices C.3 and D.3). We released 68 males and 41 females directly from the trap. Another 37 males, 14 females, and 2 jacks were held for spawning but released later (Appendix B.3). Mortality of the ponded fish was an additional two males and ten females. The mortality rate was 6.7%.

Age class break down of this run was 2 jacks, 91 four-year old males, 16 five-year olds males, 66 four-year old females, and 4 five-year old females. Our age class breakdown was as follows: less than 25 inches (64 cm) were jacks, over 25 inches (64 cm) to 32 inches (82 cm) were four-year olds, and 32 inches (82 cm) and over were five-year olds (Appendices A.3 and E.3).

Holding and Spawning

Ponded fish were injected with Erythromycin to prevent BKD. Fish being held for spawning were also treated three times per week with 100 ppm formalin drip for one hour. After sorting and spawning operation started, they were treated four times per week. No mortalities were seen due to fungus. Some small spots of fungus did show up on some fish, and future treatments should be every day after first sort. All spawned carcasses and morts were put into a dumpster and hauled to a landfill by Bitterroot Sanitation of Victor, Montana.

Erythromycin injections were administered at a rate of 1 cc/10 lb of body weight. The injection mixture was 14 grams of erythromycin phosphate, 84% active, and 250 milliliters of distilled water.

Mortality of the ponded fish was 2 males and 10 females; the pre-spawning mortality wds 6.7%.

We spawned only five females before the decision to release all fish to spawn naturally. At that time, we released the adults being held for spawning except for the CWT fish, on September 3. The number of fish released directly from the trap is quite a bit larger than the number held for spawning. The reason for this is that the bulk of the run came in after the decision not to spawn fish at Powell. The spawning operation began on August 16 and concluded on August 27. A total of three spawning days took an estimated green egg count of 24,000 eggs. We spawned five females for a fecundity of 4,800 eggs.

At the time of spawning, the crew also took samples for disease assays. Five samples were tested; one female tested high for BKD and her eggs were destroyed. All other tests were negative. The green eggs were enumerated by the Von Buyer method.

During spawning, three adult males and two jacks were used to fertilize the eggs. Spawning was done on a 1:1 male/female ratio. Ovarian fluid was drained from the eggs prior to fertilization. Eggs were water-hardened for one hour in 100 ppm Iodine solution, then transported in Walton Creek water to Kooskia Hatchery.

Incubation

All eggs were placed in a Heath stack incubator at Kooskia National Hatchery until eye-up. They were then shocked and transported to Dworshak Hatchery, where they were then picked and placed into Heath stacks. These eggs were treated with Malachite Green to prevent fungus growth.

No information as to loading rates of incubators, flows, temperature units and eyed egg numbers were supplied to us.

Early Rearing Procedures

The eggs from the four Powell females were incorporated with Dworshak stock at Dworshak Hatchery. They were identified during early rearing so that they were returned to Powell for final rearing. When we received the fish, they were 117 fish/lb.

Final Rearing

The maximum density during final rearing was 0.05 density index. The rearing pond has a packed concrete enriched earth bottom covered with a layered bottom of geotextile cloth, hypalon liner, and finally, 1- to 3-inch diameter washed cobble on the pond floor and a 6- to 12-inch rock on the sides. The water flows in through three 5-foot tall stand pipes and cascades into the pond with an average flow of 7 cfs. A walkway runs full length of the pond and holds eight Nielson feeders that are controlled by time clocks. Water temperatures ranged from 41°F to 56°F.

These fish were fed OMP-4 manufactured by Moore-Clark of LaConner, Washington. They were fed at a rate of 1.85% body weight throughout the final rearing cycle until water temperatures dropped into the lower 40s. Growth rates ranged rom 0.21 inch/month in June to 0.70 inch/month in August. These fish were fed Erythromycin twice; once at ponding June 12, 1991, and 21 days before release on October 24, 1991. Each treatment lasted for 21 days at a rate of 41 grams/100 lbs body weight. No adverse effects were noted this year. The fish fed well while on medicated feed, and showed very little of the stress response we saw last year after the Erythromycin treatment (Appendix H).

Fish Health

The only abnormal mortality occurred following a rain storm that brought in heavy sediment from logging operations upstream in Walton Creek, which occurred on June 28, 1991. Doug Munson, Fisheries Pathologist, was on-site when this occurred and inspected these fish following the heavy sediment. He found damage to the gill filaments and organic material plugging the gills. His observation that day was that the gills are bad enough, and if it happens again very soon, we could have a bad case of Bacterial Gill Disease. There was not a second occurrence of sediment, and the fish recovered (Appendix J). Final condition factor for these fish was 3.52.

Fish Marking

All of these fish were marked with a hatchery clip of the left pelvic fin. They were all released directly from the pond into Walton Creek on October 24, 1991. These fish also had a group of 65,100 fish that were CWT. There were no PIT tags in this group. These fish were all marked prior to transfer to Powell at Dworshak in June 1991. CWT codes were 10-40-12 for 54,834 fish and 10-29-42 for 10,269 fish (Appendix G).

Fish Distribution

We released 358,540 spring chinook salmon directly from the rearing pond into Walton Creek on October 24, 1991. These fish were 30.5 fish/lb (Appendix F).

A P P E N D I C E S

Appendix A-1. Length frequency distribution of Red River chinook, 1990.

Length (cm) /	Males	Females	Fish trapped	Length (in)
40				16
42				17
44				17
46				18
48				19
50				20
52				20
54				21
56				22
58				23
60	1		1	24
62	1		1	24
64	3		3	25
66	2	1	3	26
68	1	3	4	27
70	4	5	9	28
72	5	1	6	28
74	5	2	7	29
76	2		2	30
78	2		2	31
80	2		2	31
82	1	1	2	32
84	1	1	2	33
86		1	1	34
88	2		2	35
90	1	1	2	35
92				36
94	1		1	37
96	2		2	38
98				39
100				39
102	1		1	40
104				41
Totals	37	16	53	

APPS

Appendix A-2. Length frequency distribution of Crooked River Chinook, 1990.

Length (cm)	Males	Females	Fish trapped	Length (in)
40				16
42				17
44				17
46				18
48				19
50				
52				20
54				21
56				22
58				23
60				24
62	1		1	24
64	1		1	25
66				26
68	1		1	27
70	1		1	28
72	4	1	5	28
74	4	1	5	29
76	2	4	6	30
78	1	1	2	31
80	1	1	2	31
82	1		1	32
84	1		1	33
86		1	1	34
88				35
90				35
92				36
94	1		1	37
96				38
98				39
100				39
102				40
104		1	1	41
Totals	19	10	29	

APPS

Appendix A-3. Length frequency distribution of Powell chinook, 1990.

Length (cm) /	Males	Females	Fish trapped	Length (in)
38				15
40				16
42				17
44				17
46				18
48				19
50				20
52				20
54	1		1	21
56				22
58				23
60				24
62	1	1	2	24
64	1		1	25
66		1	1	26
68	3	4	7	27
70	5	5	10	28
72	8	9	17	28
74	12	9	21	29
76	18	10	28	30
78	18	12	30	31
80	16	12	28	31
82	10	3	13	32
84	4	2	6	33
86	4		4	34
88	4	1	5	35
90	2		2	35
92	1	1	2	36
94				37
96				38
98	1		1	39
100				39
102				40
104				41
Totals	109	70	179	

Appendix B-1. Red River adult length frequencies by sex of released fish.

Length (cm)	Males	Females	Fish trapped	Length (in)
40				16
42				17
44				17
46				18
48				19
50				20
52				20
54				21
56				22
58				23
60	1		1	24
62	1		1	24
64	3		3	25
66	2	1	3	26
68	1	2	3	27
70	3	2	5	28
72	5	1	6	28
74	3	2	5	29
76	2		2	30
78	2		2	31
80	2		2	31
82	1	1	2	32
84	1	1	2	33
86		1	1	34
88	1		1	35
90	1	1	2	35
92				36
94	1		1	37
96	2		2	38
98				39
100				39
102	1		1	40
104				41
Totals	33	12	45	

Appendix B-2. Crooked River adult length frequencies by sex of released fish.

Length (cm)	Males	Females	Fish trapped	Length (in)
40				16
42				17
44				17
46				18
48				19
50				20
52				20
54				21
56				22
58				23
60				24
62	1		1	24
64				25
66				26
68	1		1	27
70	1		1	28
72	4	1	5	28
74	4	1	5	29
76	2	3	5	30
78	1	1	2	31
80	1	1	2	31
82	1		1	32
84	1		1	33
86		1	1	34
88				35
90				35
				36
94	1		1	37
96				38
98				39
100				39
102				40
104		1	1	41
Totals	18	9	27	

APPS

Appendix B-3. Powell adult length frequencies by sex of released fish.

Length (cm) /	Males	Females	Fish trapped
38			
40			
42			
44			
46			
48			
50			
52			
54	1		1
56			
58			
60			
62	1	1	2
64	1		1
66			
68	3	4	7
70	5	4	9
72	8	9	17
74	11	8	19
76	18	9	27
78	18	9	27
80	16	10	26
82	9	2	11
84	4	2	6
86	4		4
88	4	1	5
90	2		2
92	1	1	2
94			
96			
98	1		1
100			
102			
104			
Totals	107	60	167

APPS

Appendix C-1. Red River run timing, brood year 1990.

Date	Daily total	Males	Females	Jacks
JUN 11				
JUN 12				
JUN 13				
JUN 14				
JUN 15				
JUN 16				
JUN 17				
JUN 18				
JUN 19				
JUN 20				
JUN 21	1	1		
JUN 22	5	3	2	
JUN 23				
JUN 24	1	1		
JUN 25	12	9	3	
JUN 26	12	8	4	
JUN 27	3	2	1	
JUN 28				
JUN 29	1		1	
JUN 30	2	1	1	
JUL 1	3	2	1	
JUL 2	1	1		
JUL 3				
JUL 4				
JUL 5	1		1	
JUL 6				
JUL 7	1	1		
JUL 8				
JUL 9	1		1	
JUL 10				
JUL 11	1	1		
JUL 12	1		1	
JUL 13				
JUL 14	1	1		
JUL 15	1	1		
JUL 16				
JUL 17				
JUL 18				
JUL 19				
JUL 20	1	1		
JUL 21				
JUL 22				
JUL 23				
JUL 24				
JUL 25				
JUL 26				
JUL 27				
JUL 28				
JUL 29				

Appendix C-1. Continued.

Date	Daily total	Males	Females	Jacks
JUL 30				
JUL 31				
AUG 1				
AUG 2				
AUG 3				
AUG 4				
AUG 5				
AUG 6				
AUG 7				
AUG 8	1	1		
AUG 9	1	1		
AUG 10				
AUG 11				
AUG 12				
AUG 13				
AUG 14				
AUG 15				
AUG 16				
AUG 17				
AUG 18				
AUG 19				
AUG 20				
AUG 21				
AUG 22				
AUG 23				
AUG 24				
AUG 25				
AUG 26				
AUG 27				
AUG 28	1	1		
AUG 29				
AUG 30				
AUG 31				
SEP 1	1	1		
SEP 2				
SEP 3				
SEP 4				
SEP 5				
SEP 6				
SEP 7				
SEP 8				
SEP 9				
SEP 10				
SEP 11				
SEP 12				
SEP 13				
SEP 14				
SEP 15				
Run Totals	53	37	16	

APPS

Appendix C-2. Crooked River run timing, brood year 1990.

Date	Daily total	Males	Females	Jacks
JUN 25				
JUN 26				
JUN 27				
JUN 28				
JUN 29				
JUN 30	1	1		
JUL 1	5	1	3	1
JUL 2				
JUL 3				
JUL 4				
JUL 5				
JUL 6				
JUL 7	3	2	1	
JUL 8				
JUL 9	1	1		
JUL 10				
JUL 11	2		2	
JUL 12	1	1		
JUL 13	1	1		
JUL 14				
JUL 15				
JUL 16				
JUL 17	1	1		
JUL 18				
JUL 19				
JUL 20				
JUL 21				
JUL 22				
JUL 23				
JUL 24				
JUL 25				
JUL 26				
JUL 27				
JUL 28				
JUL 29				
JUL 30				
JUL 31				
AUG 1				
AUG 2	3		3	
AUG 3				
AUG 4				
AUG 5	1	1		
AUG 6				
AUG 7	1	1		
AUG 8				
AUG 9				
AUG 10				
AUG 11				
AUG 12				

Appendix C-2. Continued.

Date	Daily total	Males	Females	Jacks
AUG 13				
AUG 14				
AUG 15				
AUG 16				
AUG 17				
AUG 18				
AUG 19				
AUG 20				
AUG 21				
AUG 22				
AUG 23				
AUG 24				
AUG 25	1	1		
AUG 26				
AUG 27				
AUG 28				
AUG 29				
AUG 30	2	2		
AUG 31				
SEP 1				
SEP 2				
SEP 3				
SEP 4				
SEP 5	1	1		
SEP 6				
SEP 7				
SEP 8				
SEP 9				
SEP 10				
SEP 11	1		1	
SEP 12				
SEP 13				
SEP 14				
SEP 15				
SEP 16				
SEP 17				
SEP 18				
SEP 19				
SEP 20				
SEP 21				
SEP 22	1	1		
SEP 23	3	2		1
SEP 24				
SEP 25				
Run Totals	29	17	10	2

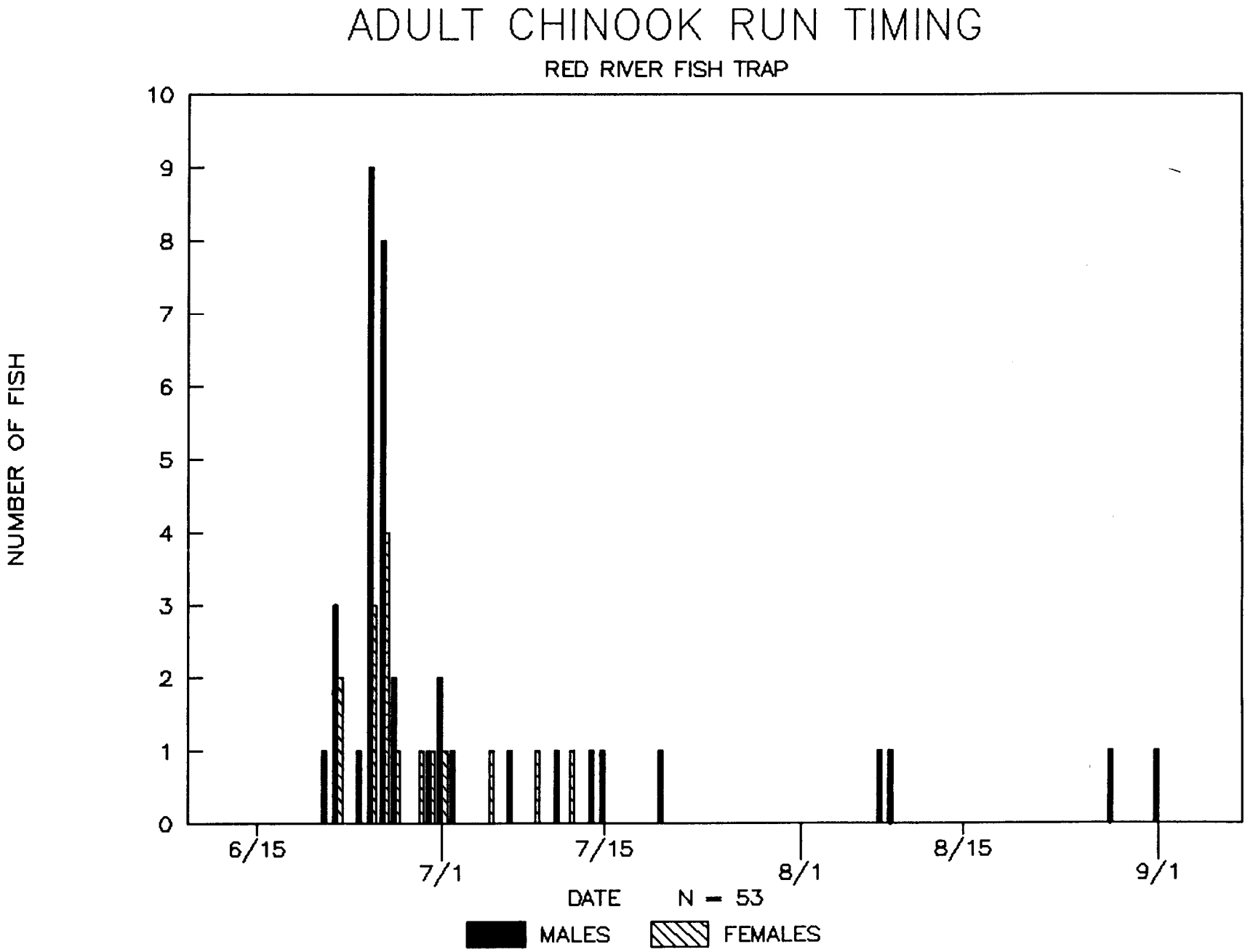
Appendix C-3. Powell Trap run timing, brood year 1990.

Date	Daily total	Males	Females	Jacks
JUN 11				
JUN 12	1		1	
JUN 13				
JUN 14				
JUN 15	1		1	
JUN 16	2	1	1	
JUN 17				
JUN 18	1		1	
JUN 19	3	1	2	
JUN 20				
JUN 21	2	1	1	
JUN 22				
JUN 23				
JUN 24				
JUN 25	2	1	1	
JUN 26	4	1	3	
JUN 27	1		1	
JUN 28	1	1		
JUN 29	2	1	1	
JUN 30	3	3		
JUL 1				
JUL 2	3	2	1	
JUL 3	3	2	1	
JUL 4	1	1		
JUL 5	1		1	
JUL 6				
JUL 7				
JUL 8	1	1		
JUL 9	1		1	
JUL 10	1	1		
JUL 11	2	1	1	
JUL 12	1	1		
JUL 13	1			1
JUL 14	5	3	2	
JUL 15	5	2	3	
JUL 16	3	2	1	
JUL 17	1	1		
JUL 18	2	1	1	
JUL 19				
JUL 20	2		2	
JUL 21	2	1	1	
JUL 22				
JUL 23	5	3	2	
JUL 24				
JUL 25				
JUL 26				
JUL 27				
JUL 28	1		1	
JUL 29	2	2		
JUL 30	2		2	
JUL 31	1		1	

Appendix C-3. Continued.

Date		Daily total	Males	Females	Jacks
AUG 1					
AUG 2		2	1	1	
AUG 3	/	1	1		
AUG 4		1	1		
AUG 5					
AUG 6		1	1		
AUG 7		2	1	1	
AUG 8					
AUG 9		1		1	
AUG 10					
AUG 11					
AUG 12					
AUG 13		1		1	
AUG 14					
AUG 15					
AUG 16					
AUG 17					
AUG 18					
AUG 19					
AUG 20		1	1		
AUG 21		1	1		
AUG 22					
AUG 23		2	2		
AUG 24		2	2		
AUG 25		3	3		
AUG 26		3		2	1
AUG 27		1	1		
AUG 28		3	3		
AUG 29		7	5	2	
AUG 30		10	8	2	
AUG 31		6	3	3	
SEP 1		10	6	4	
SEP 2		1	1		
SEP 3		7	5	2	
SEP 4		6	2	4	
SEP 5		5	2	3	
SEP 6		7	4	3	
SEP 7		5	3	2	
SEP 8		5	4	1	
SEP 9		6	5	1	
SEP 10		5	3	2	
SEP 11		1		1	
SEP 12					
SEP 13		1	1		
SEP 14					
SEP 15		2	2		
SEP 16					
SEP 17		1	1		
Run Totals		179	107	70	2

APPS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RED RIVER FISH TRAP
NUMBER OF FISH
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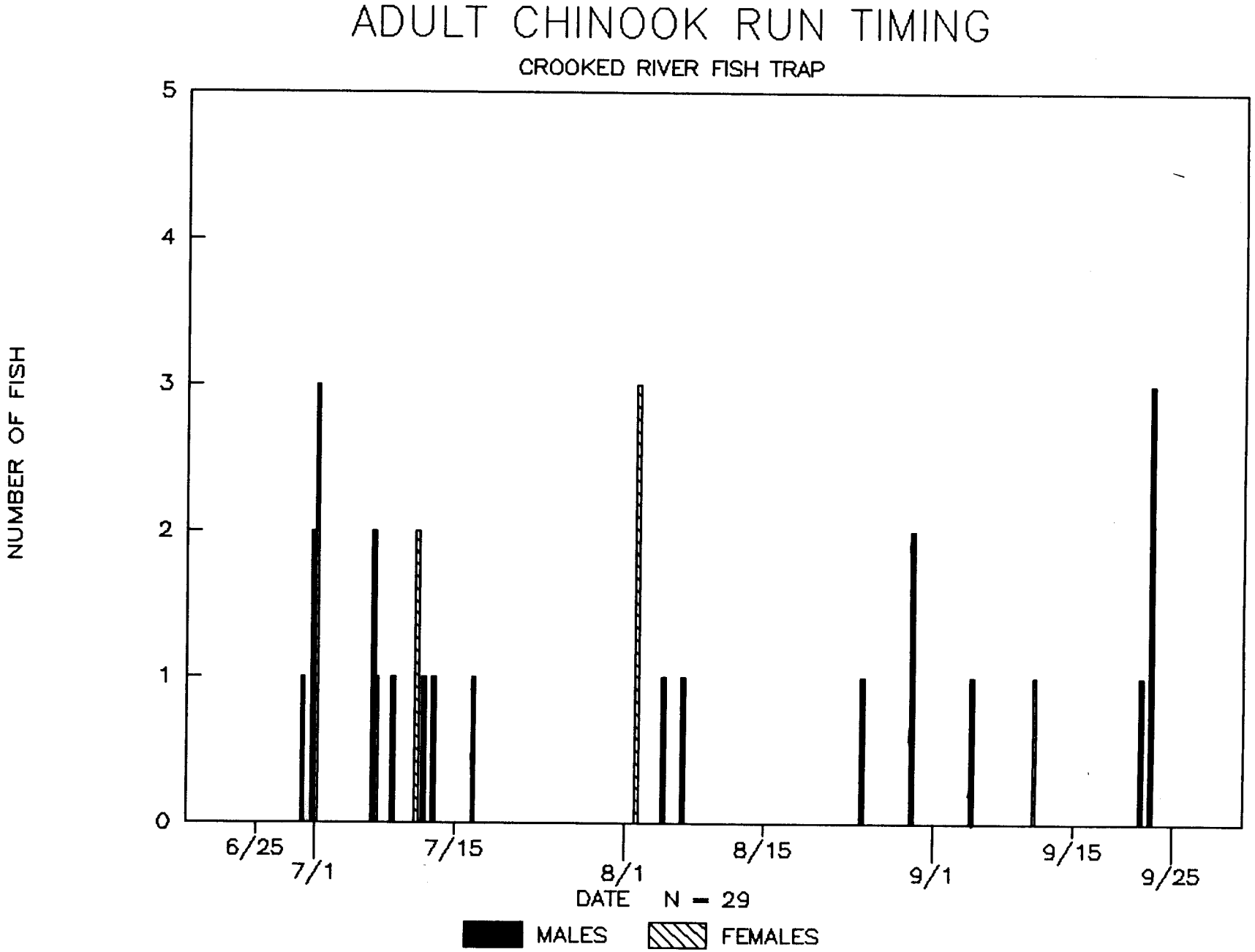
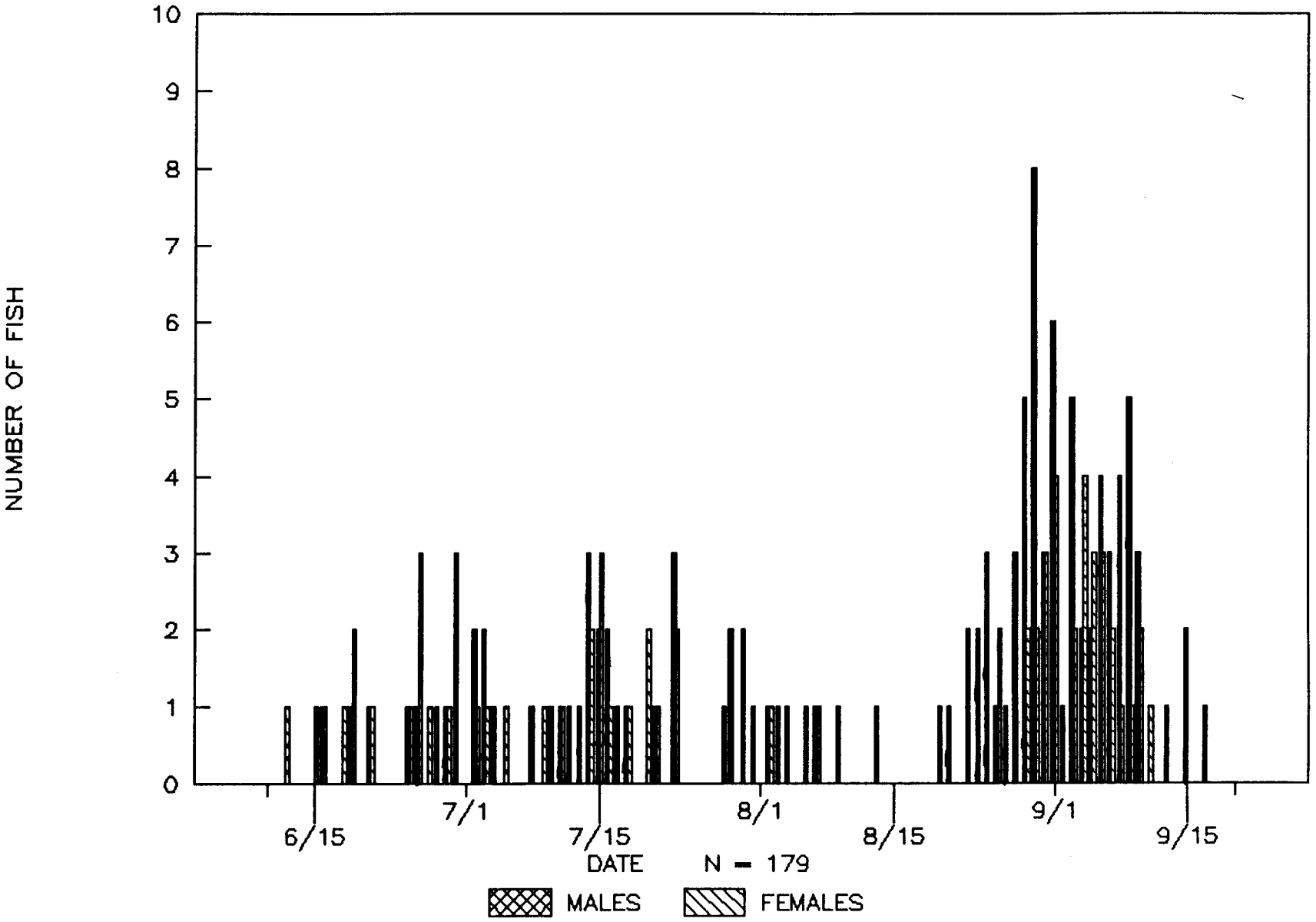
9
8
7
6
5
4
3
2
1
0
6/15
7/1
7/15
8/1
8/15
9/1
DATE
N = 53
MALES
FEMALES

Appendix D-2.


ADULT CHINOOK RUN TIMING
CROOKED RIVER FISH TRAP
NUMBER OF FISH
0
1
2
3
4
5
6/25
7/1
7/15
8/1
8/15
9/1
9/15
9/25
DATE N = 29
MALES
FEMALES

ADULT CHINOOK RUN TIMING

POWELL FISH TRAP



Appendix E-1. Summary of spring chinook returns to Red River by brood year.

Brood year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1982	Fall 1983	260,000	2	1985	[a]	1986	107	1987	109	0.036%
	Spr 1984	40,000								
1983	Spr 1985[b]	80,000	[a]	1986	377	1987	259	1988	636	0.795%
1984	Spr 1986[b]	136,800	35	1987	132	1988	74	1989	241	0.176%
1985	Fall 1986[0]	96,400	3	1988	25	1989	13	1990	41	0.021%
	Spr 1987[0]	96,800								
1986	Fall 1987	233,100	5	1989	38	1990	8	1991	51	0.022%
1987	Fall 1988	291,200	2	1990	9	1991	3	1992	14	0.005%
1988	Fall 1989	240,500	1	1991	31	1992		1993	32	0.013%
1989	Fall 1990	273,800	5	1992		1993		1994	5	0.002%
1989	Spr 1991[d]	63,000								
1989	Spr 1991[e]	124,000								
1990	Fall 1991	354,700		1993		1994		1995	0	
1990	Spr 1992[f]	207,500								
1991	Fall 1992	6,000		1994		1995		1996	0	

[a]Trap was not installed in 1986 due to construction.
[b]These fish overwintered in the rearing pond.
[0]These fish were Rapid River stock reared at Sawtooth and released directly into Red River with no acclimation.
[d]Planted off bridge at ranger station, reared at Dworshak National Fish Hatchery, Clearwater stock.
[e]Planted off bridge at ranger staiton, reared at Kooskia, Clearwater stock.
[f]Acclimated in rearing pond for 21 days, transferred from Dworshak.

Appendix E-2. Summary of spring chinook returns to Crooked River by brood year.

Brood year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1985				1988		1989	4	1990	4	ERR
1986				1989	23	1990	5	1991	28	ERR
1987	Spr 1989[a]	199,700	2	1990	13	1991	7	1992	22	0.011%
1988			2	1991	208	1992		1993	210	ERR
1989	Fall ,990[b]	339,087	13	1992		1993		1994	13	0.004%
1990	Fall 1991[a]	320,400		1993		1994		1995	0	0.000%
1991				1994		1995		1996	0	ERR
1992				1995		1996		1997	0	ERR

[a]Transferred from Dworshak Hatchery.
[b]Transferred from Dworshak and Rapid River hatcheries.

Appendix E-3. Summary of spring chinook returns to Powell by brood year.

Brood year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1984	Spr 1986			1987		1988	16	1989	16	ERR
1985	Spr 1987			1988	111	1989	20	1990	131	ERR
1986	Spr 1988[a]	200,100	27	1989	157	1990	10	1991	194	0.097%
1987	Spr 1989[b]	200,639	2	1990	16	1991	15	1992	33	0.016%
1988	Fall 1989	314,500	7	1991	249	1992		1993	256	0.081%
1989	Fall 1990	307,100	6	1992		1993		1994	6	0.002%
	Spr 1991[c]	180,764								
1990	Fall 1991	358,400		1993		1994		1995	0	0.000%
	Spr 1992[d]	150,800								
	Spr 1992[e]	53,500								
1991	Fall 1992[f]	500		1994		1995		1996	0	0.000%
	Fall 1992[g]	7,600								

[a]Rapid River stock reared at Dworshak.
[b]Clearwater stock reared at Kooskia and Dworshak.
[c]Clearwater stock reared at Kooskia; acclimated in rearing pond.
[d]Acclimated 21 days in rearing pond before release into Walton Creek, transferred from Dworshak.
[e]Not acclimated, transferred to rearing pond and immediately released.

Appendix F. Brood year 1990 pre-smolt distribution.

Destination	Weight	No./lb	No. released
Red River /	11,351	31.2	354.700
Crooked River (unbaffled)	9,361	21.4	200,669
Crooked River (baffled)'	3,110	38.5	119,731
Powell	11,731	30.5	358,400

'Pre-smolts transferred from Dworshak on 9/16/91.

Appendix G. Brood year 1990 marking and tagging data.

Release site /	Date marked	No. fish marked[a]	Type of mark/code	Purpose	No. marked fish released	Site group release
Walton Creek	6/91	10,269	LV/CWT#10-29-42	Evaluation	10,241	358,400
Walton Creek	6/91	54,834	LV/CWT#10-40-12	Evaluation	54,690	358,400
Walton Creek	10/91	700	LV/PIT	Evaluation	700	358,400
Walton Creek	6/91	359,430	LV only	Manageme	292,769	358,400
Walton Creek	12/91	63,360	CWT#05-26-35	Evaluation	60,580	63,50
Walton Creek	11/91	65,184	CWT#05-26-33	Evaluation	60,930	150,800[c]
Red River	10/91	526	LV/PIT	Evaluation	354,174	354,700
Red River	6/91	355,028	LV only	Manageme	354,174	
Red River	11/91	59,971	04T#05-26-32	Evaluation	57,796	207,500[c]
Crooked River	10/91	496	LV/PIT	Evaluation	496	320,400
Crooked River	10/91	496	LV/PIT	Evaluation	496	320,400
Crooked River	6/91	289,467	LV only[d]	Manageme	200,173	320,400
Crooked River	6/91	119,552	RV only[e]	Manageme	119,235	320,400

[a]All ventral clips were done at Dworshak. These fish were held up to fifteen days before transfer to satellite ponds.
[b]Not acclimated, released into rearing pond and immediately released.
[c]Acclimated 21 days in rearing pond.
[d]Crooked River in unbaffled raceways.
[e]Crooked River in baffled raceways (arrived from Dworshak 9-16-91).

Appendix H. Brood year production cost.

REARING TO SMOLT

No. produced	354,713	358,372	320,386
Weight	11,351	11,731	12,472
No. per pound	31.25	30.55	21.44' 38.46[1]
Percent wort.	0.13	0.28	54.1[0]
Conversion Rate	1.11	1.29	2.4

'North raceway without baffles.
[b]south raceway with baffles.
`High mortality due to thunder storm plugging intake.

	RED RIVER (BY901	POWELL	CROOKED RIVER
FOOD FED AND WEIGHT GAINED			
PERIOD FED	6/19 - 10/18	6/12 - 10/20	6/11 - 10/12
FEED USED LBS.	13,200	12,950	20,600
WT. GAIN	11,918	10,072	9,096
COST	$7,260	$5,540	$5,003
STOCKING			
DATE RELEASED	10/23	10/24	10/16
NUMBER	354,713	358,372	320,386
WEIGHT	11,351	11,731	12,471
NO. PER POUND	31.25	30.55	21.44' 38.46[1]

'North raceway without baffles.
[b]south raceway with baffles.

OPERATION COST PER LB. USING TOTAL BUDGET (less capital outlay)

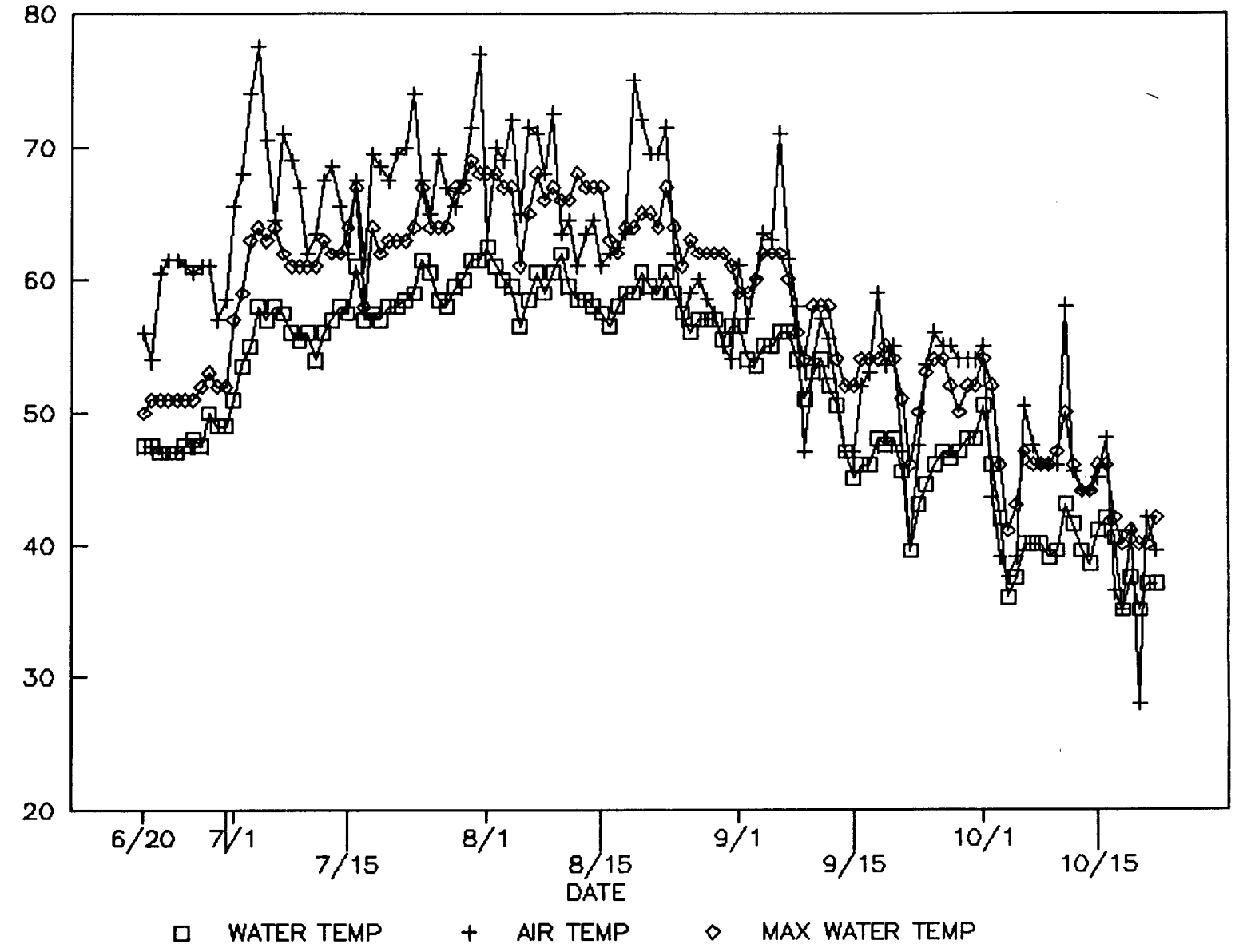
COST TO OPERATE ENTIRE PROJECT FOR '90 -91'

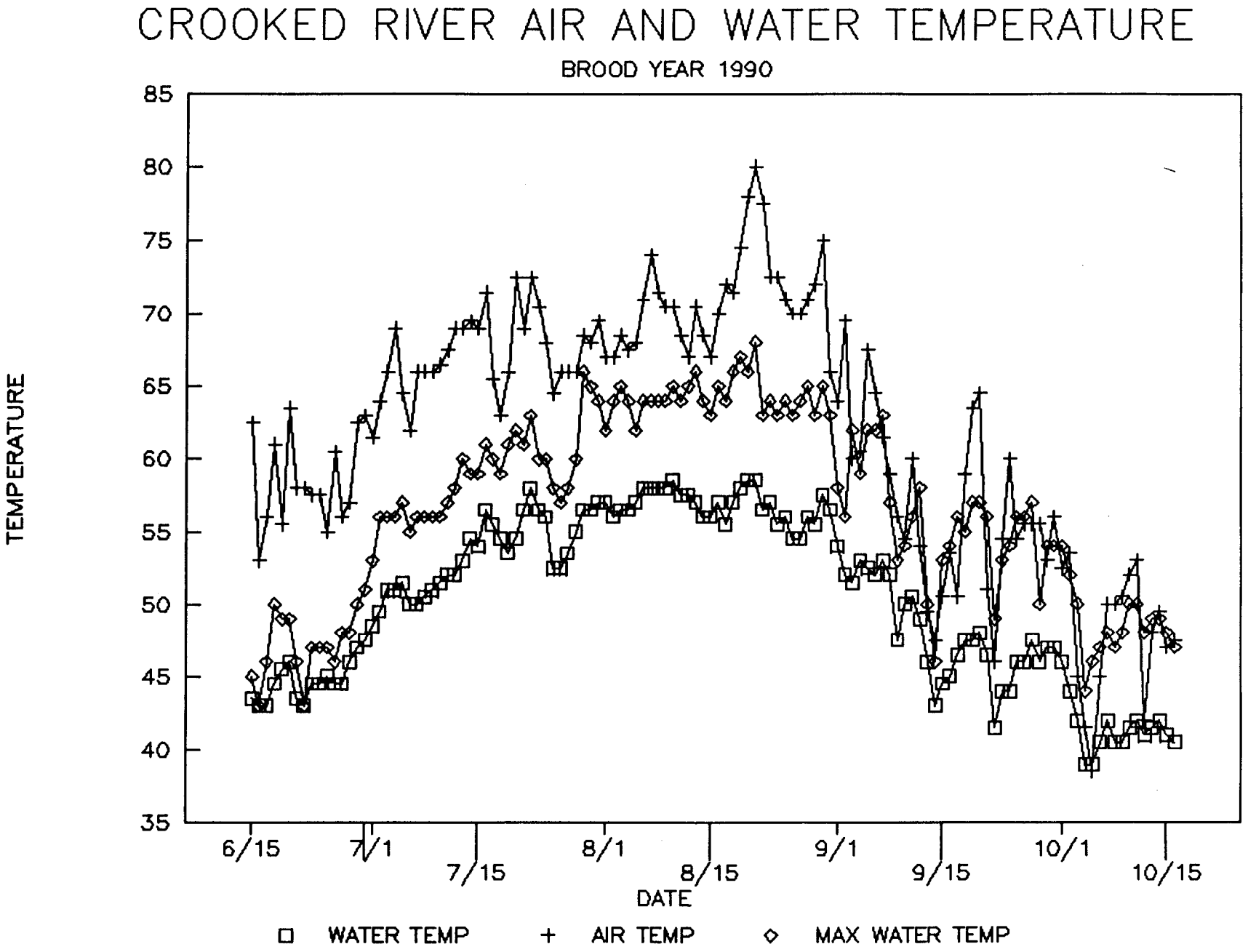
PERSONNEL COST	$180,163
OPERATION COST	$171,498
CAPITOL OUTLAY	$25,000
TOTAL	$376,661

APPS

RED RIVER WATER AND AIR TEMPERATURES

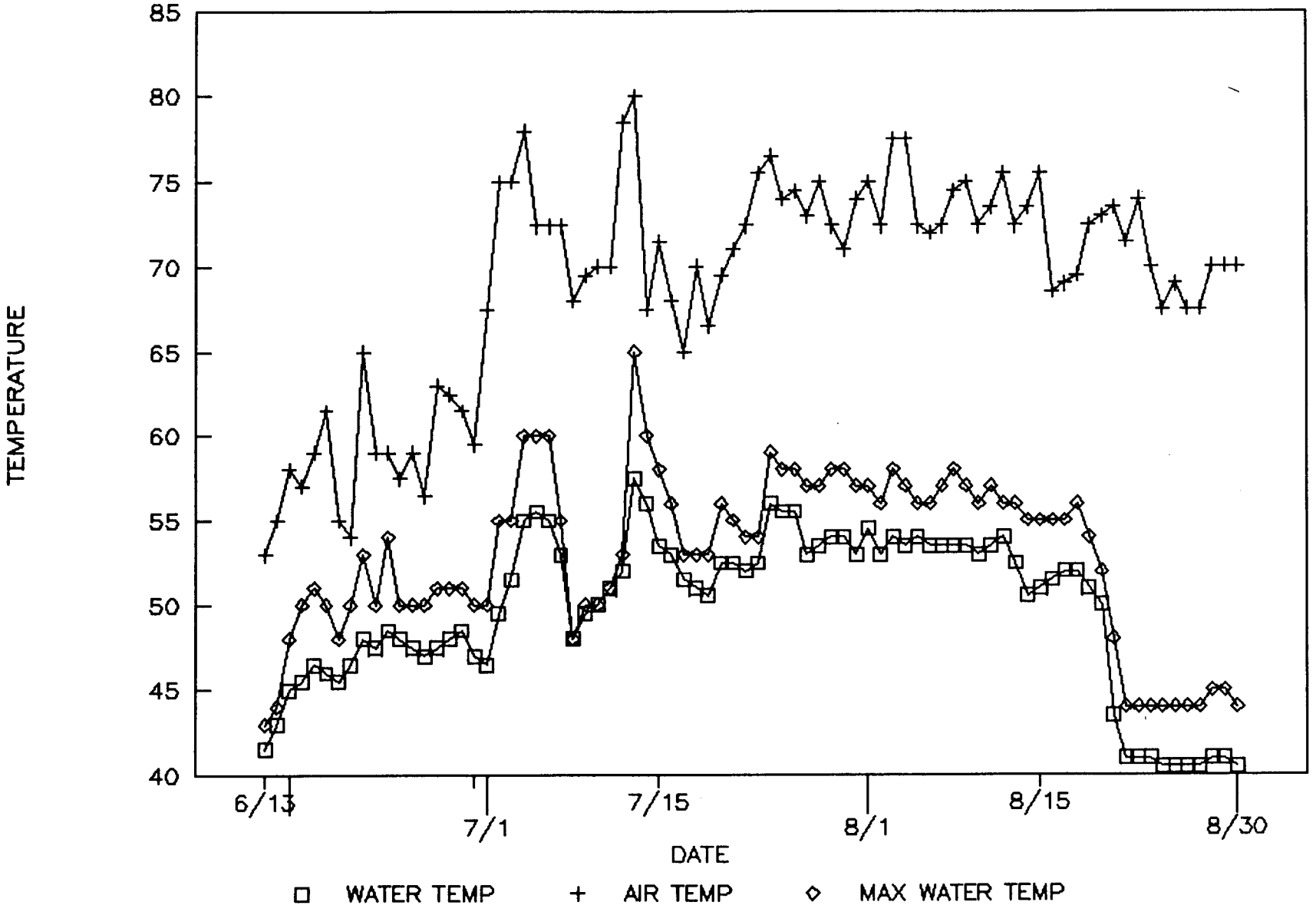
BROOD YEAR 1990




CROOKED RIVER AIR AND WATER TEMPERATURE
BROOD YEAR 1990
TEMPERATURE
85
80
75
70
65
60
55
50
45
40
35
6/15
7/1
7/15
8/1
8/15
9/1
9/15
10/1
10/15
DATE
WATER TEMP
AIR TEMP
MAX WATER TEMP

POWELL AIR AND WATER TEMPERATURES

BROOD YEAR 1990



Appendix J. Pathology Fish Health Report

Crooked River,

91-197	Dwor SC	7/1/91	BK: 0/20 Bacty: 0/4 Viro: 0/20 PI: 0/5
91-222	Dwor SC	8/6/91	Viro: 0/10 PX: 0/10 BK (FAT): 0/10
91-303	Dwor SC	10/8/91	BK (FAT): 0/60 BK (Elisa): 0/60

Powell,

91-196	Dwor SC	6/29/91	BK (FAT): 0/20 Bacty: 0/4 Viro: 0/20 PI: 0/5
91-224	Dwor SC	8/9/91	PX: 0/10 BK(FAT): 0/11 Viro: 0/10
91-259	Dwor SC	9/7/91	BK (FAT) 0/12 PW: 0/10
91-305	Dwor SC	10/10/91	BK (FAT): 0/60 BK (ELISA): 1/1 (high)
92-109	Dwor SC	3/24/92	Viro: 0/15 BR (FAT): 0/19 BK (ELISA): 1/2 + pools(low)

Red River

91-198	Dwor SC	7/2/91	BK (FAT): 0/20 Viro: 0/20 PI: 0/5
91-223	Dwor SC	8/7/91	Viro: 0/10 PX: 0/10 BK: 0/10
91-236	Dwor SC	8/15/91	PI: 1/1 + formalin trt. recommended
91-262	Dwor SC	9/10/91	BK(FAT): 0/10 PW: 0/10
91-304	Dwor SC	10/9/91	BK(FAT): 0/60 BK(ELISA): 0/60
92-108	Dwor SC	3/23/91	BK(FAT): 0/15 BK(ELISA): 0/20 Viro: 0/20

Submitted by:

Jerry McGehee
Fish Hatchery Superintendent III

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Chief
Bureau of Fisheries

Bill Hutchinson
Fish Hatcheries Manager